

Da'e...	Aug. 8	Aug. 10	Aug. 11	Aug. 12
G.M.T. ...	10.8	11.15	9.57	10.19
Height at first...	94 m.	87 m.	103 m.	78 m.
" end...	65 "	52 "	48 "	52 "
Length of path...	58 "	62 "	110 "	52 "
Velocity per sec.	48 "	40 "	—	30 "
Radiant ...	41+57	43+56	43+58	47+58

On August 13 the watch was continued, but the Perseid shower had greatly declined. About 25 meteors were recorded in about 2 hours before 11h. 45m. (when clouds came over), and of these 11 only were Perseids.

On August 14, observing for a similar interval, 19 meteors were counted, including 7 Perseids. The principal minor shower seen at Bristol recently was at $302^{\circ} + 22^{\circ}$ in Vulpecula, and the same radiant was well marked in 1908, both in July and August.

W. F. DENNING.

NOTES.

ON Monday, August 16, an exhibition of manuscripts, portraits, medals, books, and natural history specimens illustrative of Darwin's life and work was opened to the public in the central hall of the Natural History branch of the British Museum. Although most of the special portion of the exhibits is displayed in one of the bays on the right side of the hall, a table-case, containing illustrations of the fertilisation of plants by insects and other animals, and a second devoted to insectivorous plants, have been placed in the middle of the hall. In addition to these, several of the permanent cases in the hall, such as those illustrating melanism, albinism, adaptation to natural surroundings, and the breeds of domesticated pigeons, are included in the exhibition. In order that the public may properly appreciate and understand the exhibition, an excellent little guide-book has been published, at the price of sixpence, in which, in addition to a brief but comprehensive biography of Darwin, and a photograph of the Darwin statue in the museum, will be found clear explanations of the leading features of the more important exhibits. These exhibits, apart from the two botanical cases, form a total of no fewer than 251, and certainly make a most instructive and interesting display. In the compilation of the guide-book it would have been better had the author avoided the use of words of the type of "exoskeleton," which are certainly not understood by the general public. As regards the specimens displayed, we must refer our readers to the guide, or, better still, to the exhibition itself.

THE fourth International Congress of Aëronautics will be held at Nancy on September 18-24.

MR. H. E. HARRISON, principal of Faraday House, and a fellow of several scientific societies, died on August 12 at fifty years of age.

CAPTAIN H. E. PUREY CUST, R.N., assistant hydrographer of the Navy, has been appointed hydrographer in succession to Rear-Admiral A. M. Field, F.R.S., whose term of office in that appointment has expired.

REUTER messages from Tokio report that a severe earthquake was felt at 3.30 p.m. on August 15 throughout Central Japan. Much damage was done to the important commercial city of Nagoya, which was practically destroyed by the earthquake that visited the district in 1891. Considerable damage is stated to have been done in part of the Shiga Prefecture.

WE learn from the *Times* that on August 12 the Italian balloon *Albatross*, manned by Lieut. Mina and Signor

Piacenza, and starting from Turin, reached the height of 38,715 feet, at which point one of the two aeronauts opened the valve. The highest altitude previously attained in a manned balloon was 35,500 feet, reached by Berson and Süring on July 31, 1901. The new record is equivalent to an altitude of 7.3 miles, and shows the great heights which can be attained when improved means of respiration are employed.

WE record with regret the death, on August 14, of Mr. William F. Stanley at eighty-one years of age. Mr. Stanley was well known as a maker of scientific instruments; in 1856 he invented the first simple open stereoscope, and later he designed and manufactured scientific instruments for the use of various Government departments. He was the author of several text-books, and in 1895 he published "Notes on the Nebular Theory in Relation to Stellar, Solar, Planetary, Cometary, and Geological Phenomena," the book being reviewed in the issue of *NATURE* for November 14, 1895 (vol. liii., p. 25). In addition to other beneficent acts, Mr. Stanley erected and equipped at Norwood the Stanley Technical Trade Schools, where boys are educated on thoroughly practical lines. The schools have been endowed adequately, and are for the future to be administered by the Charity Commissioners.

As has been already announced, the ninety-second annual meeting of the Société helvétique des Sciences naturelles will be held this year at Lausanne on September 5-8. The business of the meeting will be conducted in six sections, as follows:—section of physics and mathematics, president, Prof. H. Dufour; chemical section, president, Prof. H. Brunner; section of geology and geography, president, Prof. Lugeon; agronomic section, president, Prof. E. Chuard; botanical section, president, Prof. E. Wilczek; and the section of zoology and physiology, president, Prof. E. Bugnion. On September 6 two lectures will be delivered, one by Prof. S. Finsterwalder on aërodynamics in aviation, and the other by M. Auguste Forel on comparative psychology, determinism, and the theory of memory. Three lectures will be delivered on September 8 at Vevey, as follows:—M. Fritz Sarasin, on the history of the animal life of Ceylon; M. Raoul Gautier, on some recent important results furnished by astronomical photography; and M. Martin Rikli, on the natural history of Greenland. Full particulars of the meeting may be obtained from the general secretary, Prof. Paul L. Mercanton, the University, Lausanne.

TO *Annotationes Zoologicae Japonenses*, vol. vii., part ii., Dr. N. Annandale, of the Indian Museum, communicates a paper on Japanese freshwater sponges, in which an apparently new species is described. Of the five known Japanese species, three are widely distributed and the other two peculiar to Japan.

THE combined July and August issue of *Nature* contains an important paper, by Messrs. Bjørn Helland-Hansen and Fridtjof Nansen, on annual fluctuations in the mean temperature of the sea on the Scandinavian coast and their influence on the climate, agriculture, and fisheries of Norway. The paper is illustrated with a large number of temperature-charts.

IN the August number of the *Irish Naturalist* Mr. C. B. Moffat suggests that one reason why certain species of birds construct covered nests is to enable them to rear a larger number of nestlings than would otherwise be possible. The author supports this theory by mentioning

that out of the eight species of Irish birds which make domed nests, six lay larger clutches of eggs than birds which are content with open nests.

THE August number of *British Birds* contains reproductions from eight very remarkable photographs of a water-rail taken by Miss E. L. Turner. Some of these exhibit the bird in the act of removing its young from the nest; but whether this action represents a normal or an abnormal trait remains to be decided. To have obtained these beautiful photographs of such a shy and wary bird as the water-rail is a great triumph for the artist. We may also refer to a note by Mr. F. J. Stubbs, in which attention is directed to the fact that on certain Yorkshire grouse-moors there is no heather or heath, the place of which is taken by crowberry, and that on such grounds the birds, so far as can be ascertained, are free from disease.

WE have to welcome a new biological serial, the Transactions of the Royal Society of South Africa, of which we have received the first part of vol. i., comprising 319 pages of text and twenty-four plates. Among the more important articles, reference may be made to Mr. R. B. Newton's report on Cretaceous shells from Zululand. Many of these are identical with or nearly allied to South Indian Cretaceous forms, especially those from the Trichinopoli group; and it is specially interesting to note that some of these indicate a connection between the Cretaceous fauna of Trichinopoli and Angola. This suggests that the great tropical land-barrier shown in Neumayr's map of the Jurassic epoch had become partially broken up by Cretaceous times. Another important communication is the first part of Dr. L. Péringuey's descriptive catalogue of South African Coleoptera, dealing with the family Meloidæ.

OWING to a severe outbreak of a fungal disease in the mulberry nurseries near Srinagar, connected with the silk industry in Kashmir, Dr. E. J. Butler was deputed by the Indian Government to investigate the matter. The results of his investigation are published in the Memoirs of the Department of Agriculture in India (vol. ii., No. 8). The disease was traced to *Coryneum mori*, a fungus of the Melanconiales, previously recorded only from Japan. The fungus is a wound parasite which found its opportunity after a severe frost; it was also discovered on mulberry trees outside the nursery, and on a jungle tree, *Celtis caucasicum*. Reference is also made to three other fungi: *Septogloeum mori*, producing leaf-spot; *Phyllactinia corylea*, a mildew; and the bracket-fungus *Polyporus hispidus*—none of which, however, were doing much damage.

THE curious instances of polymorphism in the flower which occur in the orchid *Cynoches* are described by Mr. R. A. Rolfe in the *Kew Bulletin* (No. 6), where he provides a revision of the genus. The production of flowers so different in appearance puzzled Lindley and other botanists until the solution was found in the dissimilarity between staminate and pistillate types. Nine species are recorded for which both types are known, and in six cases only the staminate flowers have been definitely identified. Two sections of the genus are recognised; in the *Eucynoches* the difference lies chiefly in the column and attached sexual organs; in the *Heteranthæ* the distinction is more marked, as the staminate flowers are smaller, sometimes different in colour, and the lip is reduced to a small disc margined with clavate teeth.

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INVESTIGATIONS on abstruse points in plant morphology have within recent years engaged the attention of several Austrian botanists. Two papers appear in the *Bulletin International* (1907), the official publication of the Académie des Sciences de l'Empereur François Joseph I., Prague. Miss M. Doubek contributes a discussion of the much-debated nature of the tendrils in the Cucurbitaceæ. An explanation is constructed on the hypothesis of adnation by different axes. The least complex examples—they cannot be described as simple—are furnished by *Luffa* and *Cucurbita*, but the author also offers solutions of the more difficult cases provided by *Bryonia*, *Cyclanthera*, and other genera. The second paper, communicated by Dr. B. Nemec, deals with regeneration in the unifoliate plant *Streptocarpus Wendlandii*. Some of his experiments were made with irregularly regular specimens bearing two well-developed cotyledons.

THE arrangement of the botanical garden of the Johns Hopkins University, which is described in the University Circular (No. 217), shows some novel features. The garden, which is being established primarily as an aid to botanical research and instruction, is divided into four sections. Two are planned for the cultivation of typical forms illustrating vegetative and reproductive organs. The third is devoted to plant relationship, as exemplified by species, genus, &c., extending to systems of classification for which Engler's system is selected for complete exposition. The fourth section contains two divisions, one for economic, the other for cultivated plants. The latter should be quite the most interesting feature in the garden. The three genera *Dianthus*, *Rosa*, and *Chrysanthemum* are chosen as types to indicate the origin and natural relationship of horticultural races. Cultivated roses are arranged under fifteen sections, and in addition eight groups of hybrids are illustrated.

A PAMPHLET published by the Hawaiian Sugar-planters' Association as Bulletin No. 9 of the division of pathology and physiology is devoted to an investigation by Messrs. L. Lewton-Brain and Noël Deerr of the bacterial flora of Hawaiian sugars. Sugar agar was the most satisfactory medium, as, for some reason undetermined, it was impossible to get a good gelatin preparation. Another difficulty was presented by what the authors term a "weed-bacillus" that produced its spores within twenty-four hours, and so escaped sterilisation. The practical object was to isolate and identify types of bacteria with the view of studying their action on moist sugars. Five different types were distinguished by the shape of the individuals or of the colonies formed in different media; their general action is to reduce the sucrose and form invert sugar, gum, or other products in sugars containing 1 per cent. or more of moisture.

THE Purdue University Agricultural Experiment Station has issued a pamphlet (Circular No. 15) on the growth of onions, an important crop in northern Indiana to which many hundreds of acres are annually devoted. The methods adopted on the large scale are described at length, and suggestions are offered for improvement; curing and marketing are also dealt with. Another pamphlet deals on similar lines with the Indiana cantaloup industry. In Bulletin No. 134 Messrs. Hunziker and Spitzer discuss methods for the estimation of fat in unsweetened evaporated milk. Since the introduction by the Act of Congress, 1906, of the new pure food standards requiring a definite minimum per cent. of fat and solids in evaporated milk, the product from numerous milk-condensing factories has been found below standard, rendering them liable to

prosecution by Government and State authorities. It was known that no fat was removed by the firms in question, and the authors show that the fault lies in the method of analysis, the ordinary Babcock method failing to show all the fat in evaporated milk. A suitable method, giving correct results, is described.

THE introduction of labour-saving machinery on the farm has been one of the principal features of the modern revolution in agriculture, and has been rendered necessary by the difficulty of getting sufficient help. Few contrivances are more interesting than the milking machine. Rubber funnels are fitted on to the teats and connected by stout tubing to a milk-can; the pressure is diminished by a pump to about half an atmosphere when the milk begins to flow. A lengthy test has been made at the Wisconsin Agricultural Experiment Station, and is recorded in Bulletin No. 173. The machine worked more quickly and more cheaply than a man; it yielded a cleaner milk, which therefore kept better, and, finally, was shown to have no injurious effect on the udders or the general health of the animals. The machine, of course, requires proper attention and careful driving to get the best results, but proved decidedly economical in herds of thirty cows or more. There are already signs that the agricultural labourer of the next generation will be, in the main, an engineer.

WE have received from Mr. Stewart J. McCall, Director of Agriculture, Nyasaland, an interesting pamphlet on the growth of cotton in America. The four types dealt with are (1) Sea Island cotton, a small high-quality crop, forming less than 1 per cent. of the total American crop, but very important by reason of its quality; (2) upland cotton, short staple, the principal variety in commerce; (3) upland cotton, long staple, which has only been introduced within the last few years, and is almost exclusively confined to the rich bottom lands of the Mississippi; (4) Egyptian cotton, introduced to supply the manufacturers' demand for a lustrous cotton, well adapted for mercerisation. The pamphlet is written for the African cotton grower, and great stress is laid on the necessity for keeping out of Africa the cotton weevil, which has done incalculable harm in America, and made cotton cultivation impossible in some places. Mr. McCall suggests that all seed imported from America should pass through a Government Department for examination and treatment. The question of distributing insect and fungoid pests by artificial means has to be considered seriously. Unfortunately, our administrators are often insufficiently in touch with scientific problems to realise that a small pest which could at little expense be kept out of a country may do great damage once it is introduced.

THE mixed population of Manila, which includes almost all races of mankind in varying degrees of purity, has afforded to Mr. R. B. Bean an unrivalled opportunity of studying the different types of human ears, and formulating, for the first time, a morphological classification of the same. His results, which are published in the first number of vol. iv. of the *Philippine Journal of Science*, cannot fail to be of great interest to anthropologists. Names, such as Malay, Negroid, Cro-Magnon, Alpine, &c., are given to these various types of ears, which are characteristic of definite physical types of men, although it does not necessarily follow that they are also distinctive of all members of the races whose names they bear. The Alpine ear is, for example, the ear of the fat man. In the Philippines the author finds that ears not of European origin are morphologically older than those of European

type, and from these data he draws certain conclusions as to the evolution of the modern Filipinos.

DR. F. ERK, director of the Bavarian Meteorological Service, has contributed to part i., vol. iii., of "*Beiträge zur Physik der freien Atmosphäre*" an interesting paper on the relations of the upper inversion of temperature to the areas of high and low atmospheric pressure. The author, who has the experience of a critical examination of daily weather conditions during the last twenty-five years, assumes, from the labours of recent investigators, that the relatively high temperatures of the region of the upper inversion (the "stratosphere") arise from the absorption of radiation, not from the surface of the earth, but from strata of some 4000 metres in height. He discusses at considerable length the effects of the descending air in the high-pressure areas of the upper regions and of the advance of the low-pressure systems towards the stratosphere, and shows how a registering balloon on entering the stratosphere must first meet with a rapid increase, and afterwards with a gradual decrease, of temperature. Photograms of the curves obtained during ascents at Hamburg and Munich on the same day and with similar instruments exhibit these phenomena very clearly, and show the desirability of the more frequent publication of results in this way instead of tabular statements only.

A NEW recording rain gauge made by Messrs. Negretti and Zambra, which the makers have named the hyetograph, is now procurable, and supplies a much-needed want. Meteorologists have looked forward to the time when a simple register should be obtainable of the duration and amount of rainfall day by day. The instrument has the advantage of great simplicity, and it is scarcely possible for it to get out of order. The only movable parts are the clock drum, the float, and the pen lever. The hyetograph practically gives equal results with the necessarily more expensive Halliwell's patent rain gauge, of which Messrs. Negretti and Zambra are also the makers. The funnel is 8 inches in diameter. The float has the capacity for measuring $4\frac{1}{2}$ inches of rain, which is the maximum amount likely to occur in one day in almost any locality in Great Britain. The spindle attached to the float has a number of pins or projections, and these engage successively with a lever arranged so that when the pen reaches the top of the chart, wound round the clock drum, the lever disengages with the pin or projection and falls by its own weight on to the next lower pin, which is so placed as to allow the pen to fall to zero on the chart. The whole of the working parts are protected by a stout galvanised iron cover, and the water collected is removed by a hand-started syphon. The hyetograph complete, with 100 special charts, costs 6l. 15s.

THE "Report of a Magnetic Survey of South Africa," upon which Prof. J. C. Beattie, of Cape Town, and coadjutors have been engaged, with the aid of Royal Society and colonial grants, for a series of years, has now been published by the Royal Society at the price of 20s. net. It forms a quarto volume with numerous maps and plates, uniform with Rücker and Thorpe's Survey of the British Islands. Copies may be obtained from the Cambridge University Press Warehouse.

WE learn from the *Amateur Photographer* that Messrs. Aldis Bros., of Birmingham, have perfected a periscope lens which enables the observer to see completely round the horizon without movement of either himself or the lens. It consists of a ring of glass with an outer curved

surface, while the inner surface, which is inclined and plane in one direction, serves to reflect the light that enters the system down the axis of the vertical tube that carries the lens at its upper part. A reflecting prism enables a horizontal eye-piece to be used. The lens has already been approved by the Admiralty for use in the conning towers of submarines. A photograph taken by it gives a well-defined annular picture of the view as seen in every direction around it.

We have received a copy of a paper, by Mr. Louis Derr, on a photographic study of Mayer's floating magnets (Proceedings of the American Academy of Arts and Sciences, vol. xlv., No. 19, May). Although it is now recognised that inferences made in regard to the structure of matter from the exact behaviour of such floating systems must be received with caution, yet the groupings obtained are so suggestive that any fresh study of them is of interest. Mr. Derr has endeavoured to obtain a

Mr. Irwin G. Priest. The method depends on the measurement of the diameter of one of the circular rings of the Fabry-Perot interferometer when seen through the lens by reflected homogeneous light. If viewed without the intervention of the lens, the ring system is localised at infinity, and with the lens a real image will be formed in the focal plane of the lens. The outer edges of the rings are sharp, and admit of accurate measurement of diameters by means of a micrometer. From two measurements of the diameters of the same ring with different distances between the interference plates, the focal length of the lens can be found with an accuracy of about half per cent., and if with the interference plates a fixed distance apart the constant of the apparatus be determined once for all, a single measurement of the diameter of a ring is all that is necessary.

THE four numbers of the Journal of the Royal Society of Arts issued in July contain the Cantor lectures on the

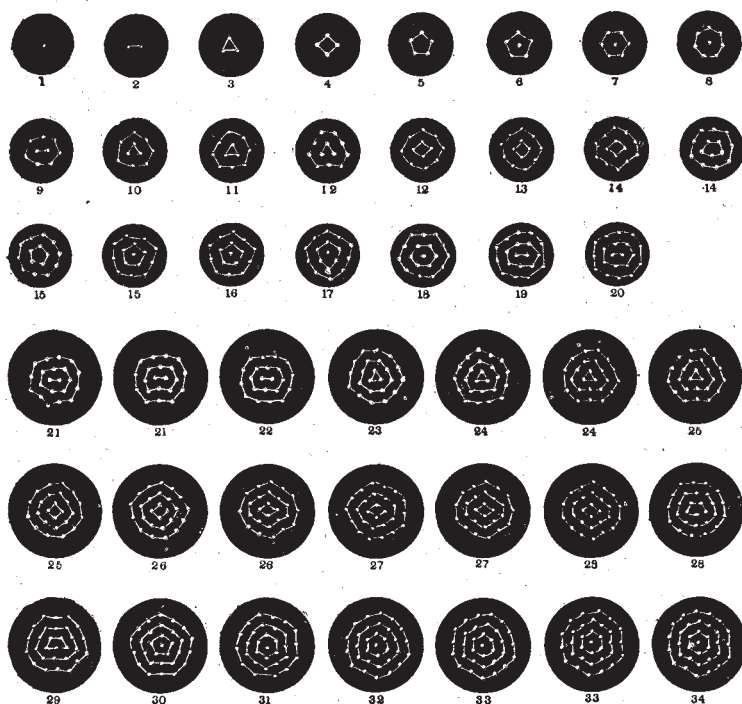
public supply of electric power delivered by Mr. G. L. Addenbrooke before the society in January and February last. After describing with great clearness the present position of affairs, the lecturer points out in what directions we may reasonably look for improvements in the future. Whatever the improvements in prime movers, he believes that electrical power will still be the most suitable for factories. This power will, when gas engines and producers have been rendered more suitable and trustworthy, be produced by internal-combustion engines of the four- or six-cylinder type. He considers that the time now required to obtain a provisional order in the case of a power scheme should be greatly reduced, and wishes to direct the attention of legislators to the importance of facilitating the supply of cheap electric power.

NONE of the formulæ in common use connecting the pressure and temperature of saturated steam can be regarded as satisfactory. Any empirical formula should cover the whole range, give a fair representation of those experimental results which probably approximate most closely to the true relation, and should be easy of calculation. Mr. S. Godbeer, in an article in *Engineering* for August 6, presents a new formula which should be useful. For various reasons, a table given by Holborn in 1908, ranging from 0° to 205° C., together with experiments by Cailletet covering a range up to the critical temperature, have been used as data. A few irregularities have been corrected, and the formula is as follows:—

$$\log p = \frac{13.19 (t + 226) (t + 2299)^2}{192028 (t + 808) (t + 329)} - 30.203,$$

where p is the pressure in millimetres of mercury and t is the temperature centigrade. If pressure and temperature curves be drawn for the experiments of Cailletet, Battelli, and Knipp, it becomes evident that there is a sudden disturbance in the general trend of the curve between 240° and 270° C., and the author suggests that further experiments in this region of temperature would be interesting.

METAL-CUTTING by means of oxygen is now finding a place among engineering operations, and several interesting applications are given in *Engineering* for August 6. The



Photographs of systems of floating magnets.

much more complete series, which he has photographed in order to show the progression from one form to another more clearly than can be done by tables. The magnets were clear $\frac{1}{4}$ -inch steel balls, floated on freshly filtered mercury, as described by Prof. R. W. Wood, but initially magnetised by placing them one by one between the poles of an electromagnet. In the plate (part of which we reproduce) the balls as photographed have been connected together afterwards by lines, in order to bring out more obviously to the eye the formation in concentric groups. Many of the forms differ from those calculated by Sir J. J. Thomson; since the stability depends upon the exact law of force between the magnets—and in the experiments this is different from the law assumed in the calculations—the divergence is not to be wondered at.

THE May number of the Bulletin of the Bureau of Standards contains a description of a new method of determining the focal length of a converging lens system, by

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instrument used consists of an oxy-hydrogen, oxy-coal-gas, or oxy-acetylene mixed blowpipe, through which an additional stream of oxygen can be supplied at will by the operator. The object is to heat to incandescence the part on which the jet of oxygen is afterwards to play, and to keep it at that high temperature all the time the oxygen jet is operating. This method has been found to overcome entirely the older difficulties with regard to unsteady manipulation of the oxygen jet, as well as the trouble due to the presence of iron oxide. Plates and slabs of steel up to 12 inches in thickness can be cut by this method. The cut is very clean, and, in one example illustrated, where a slab of steel 8 inches thick was cut into pieces $\frac{3}{8}$ inch in width, the width of the cut was only about $\frac{1}{4}$ inch, showing the intensely local nature of the operation. Another illustration shows an armour plate being cut circular by means of a special appliance carrying a blowpipe, the thickness of the plate in this example being 9 inches. The cut surfaces are left comparatively smooth, and the cut is square down from the face of the plate, although it is possible also to make bevel cuts. All grades of steel can be operated on.

MR. H. K. LEWIS, of Gower Street, London, has sent us a copy of a catalogue of the new books and new editions added to his medical and scientific circulating library during the second quarter of this year. The list will be sent post free to any address on application.

A SECOND edition of Prof. Marcel Moyer's translation of Prof. Lowell's "Mars and its Canals" has been published at the office of the *Mercure de France*, Paris. The original volume has already been reviewed in these columns, and we are glad of this opportunity of congratulating Prof. Moyer on the demand for a second edition of his translation of Prof. Lowell's interesting book. The price of the translation is five francs.

SIR WILLIAM RAMSAY's volume of "Essays, Biographical and Chemical," which was reviewed in NATURE of July 29, has been translated into German by Prof. W. Ostwald, and published by the Leipzig Akademische Verlagsgesellschaft, under the title, "Vergangenes und Künftiges aus der Chemie." The German volume includes, in addition to the essays of the original work, an autobiographical sketch by Sir William Ramsay, occupying thirty-five pages.

OUR ASTRONOMICAL COLUMN.

OBSERVATIONS OF MARS.—Circular 110 from the Kiel Centralstelle announces that, at 2 p.m. on August 12, M. R. Jonckheere observed a brilliant spot detach itself from the polar snows of Mars and cover the Novissima Thyle, in longitude 320° .

In No. 4340 of the *Astronomische Nachrichten* M. Jarry Desloges records some observations of Mars made at the Massegros Observatory (Lozère) during June and July.

On June 20 and 23 a dark cutting was seen in the south polar snows, in longitude about 190° , and appeared to terminate in a rounded spot, which was of a darker shade. The crevasse observed by Prof. Lowell in longitude 350° was easily seen on July 4 with a 37 cm. refractor installed on the Revard plateau, and appeared to traverse the whole length of the visible part of the snow-cap. On the same day, at 4h. 15m. a.m., a broad, bright spot was seen on the dark edge of the snow in about longitude 30° .

RE-DISCOVERY OF PERRINE'S COMET.—A telegram from the Kiel Centralstelle announces that comet Perrine was discovered by Herr Kopff at 10h. 54m. (M.T. Königstuhl) on August 12. The position of the comet at that hour was R.A.=oh. 17.1m., dec.= $35^\circ 32'$ N., and the magnitude was 15.0.

Of the three ephemerides given by Herr Ristenpart, the NO. 2077, VOL. 81]

first (T=October 27.5) gives the nearest position to the above for August 12, the ephemeris place being

R.A.=oh. 40.2m., dec. $36^\circ 45.9'$ (1910.0).

THE NUMBER OF THE STARS.—In the August number of the *Observatory* (No. 412, p. 323) Mr. Gavin Burns directs attention to the discrepancy between the Groningen and the Harvard estimates of the total number of stars, and suggests that Prof. Kapteyn's estimate is probably excessive. Tabulating the figures given by each of the two observatories, he shows that from the tenth magnitude downwards the Groningen numbers are greatly in excess of those given by Prof. Pickering; for example, the respective totals, including all stars down to the 10.5 magnitude, are 607,551 and 604,000, but if the 13.5 magnitude be included they are 14,582,551 and 6,761,000. Then there is a note in the Harvard publication which suggests that if stars to the fifteenth magnitude were included the total would be raised to about 18 million, whereas Prof. Kapteyn's estimate for magnitude 14.5 is 38 million, and for magnitude 15.5 98 million. A published investigation of the Greenwich astrographic plates shows agreement with Harvard for the fainter magnitudes, and strengthens the suggestion that the Groningen estimates are too high.

THE FAINT COMPANIONS OF PROCYON AND SIRIUS.—During last winter Prof. Barnard employed the Yerkes 40-inch refractor on many occasions in an endeavour to detect and measure Schaeberle's faint companion to Procyon, but only on a few occasions was he successful. The results, which are published in No. 4345 of the *Astronomische Nachrichten* (p. 13, August 7), show that during the last five or six years the angular motion of the companion has been about $5.2''$ per annum, but the distance has changed but little. The weighted means, for 1909.162, were $22.51''$ and $5.26''$ respectively. Prof. Barnard states that the least atmospheric diffusion of the light of the large star hides the close companion, and then explains a device which he uses to obviate the adverse effect of the stray light. This is to place a hexagonal diaphragm over the 40-inch object-glass so that the angles of the hexagon lie on the periphery of the glass. This collects the stray light into six thin bright rays, and the small star can be more easily seen in the dark space between a pair of the rays.

A similar device was employed in observing the faint companion to Sirius, and the measures made during the period 1903-9 are given in the same journal. These show that the angle is decreasing, from $115.38''$, for 1903.808, to $92.53''$, for 1909.135, whilst the distance is increasing, the values for the corresponding epochs being $6.32''$ and $8.75''$ respectively.

PROF. LOWELL'S NEW 40-INCH REFLECTOR.—A brief description of the new 40-inch reflector which Messrs. Alvan Clark and Sons are just completing for Prof. Lowell appears in No. 412 of the *Observatory*. The focal length is 18 feet 4 inches, and the mirror, cast at St. Gobain, is 7 inches thick and weighs more than 900 lb. The cell is an iron ring with zinc blocks so arranged that the combined expansion is the same as that of the glass, thus obviating distortion. For planetary photography the reflector can be used as a Cassegrain of 154 feet, or 75 feet, focal length, whilst for stars and nebulae it will be used as a Newtonian with the plate at the principal focus. In order to protect the instrument from the wind, and partially from large temperature changes, it will be mounted in a pit sunk 6 feet into the ground, over which is erected a hemispherical dome of wood and canvas. The requisite diurnal motion is to be imparted to the instrument by two electric motors, one for driving, the other for slow motion.

WATER VAPOUR IN SUN-SPOTS.—In the July number of the *Astrophysical Journal* (vol. xxx., No. 1, p. 44) Mr. W. M. Mitchell discusses the various researches which have led to the suggestion that water vapour exists in sun-spots. He points out that the spectroscopic evidence is not unanimous, either for or against, and is certainly not conclusive.

The affected spot lines may be due to other substances not yet identified, and giving lines of nearly similar wavelength. Then the apparent intensification may be a sub-